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ABSTRACT

An instructor's manual and student activity guide on plumbing are provided in this set of prevocational education materials which focuses on the vocational area of trade and industry. (This set of materials is one of ninety-two prevocational education sets arranged around a cluster of seven vocational offerings: agriculture, home economics, distributive education, health occupations, world of work, trade and industry, and office occupations.) The instructor's guide is organized into the following elements: title of activity, duration of activity (three to eight periods), activity goals, three instructional objectives, related vocational clusters, and activity implementation (description, materials needed, safety considerations, teacher preparation prior to class, during the class, follow-up activities, masters for duplication [e.g., interview sheet, student checkpoint booklet], and a set of transparencies). The student activity guide focusing on the assembly of a garden sprinkler provides step-by-step instructions (narrative and illustrations) for completing each instructional objective (e.g., cutting plastic pipe, drilling holes in the pipe, joining fittings). At the end of each set of instructions is a student check point (evaluation activity). Occupational descriptions for a plumber, pipe cutter, and plumbing assembler-installer conclude the document. (JH)

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ED169356

# T & I – PLUMBING

**Kit No. 67**

## INSTRUCTOR'S MANUAL

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**1978**

CE 020 541

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## TITLE OF ACTIVITY

Kit No. 67, T & I – Plumbing

## DURATION

Main Activity: 2 -- 4 periods
Follow-up Activity: 1 – 4 periods

## GOALS

The student will become familiar with the processes involved in cutting plastic (PVC) pipe.

The student will learn how to join pipe and fitting to create different angles involved in plumbing work.

The student will learn how to join several fittings with pipe to create a useful product.

## INSTRUCTIONAL OBJECTIVES

Given the necessary tools and equipment, the student will lay out and cut all the necessary lengths of 1/2 inch (1.27 cm) PVC pipe for successful completion of this activity.

Given the necessary tools and equipment, the student will successfully drill the spray holes in the two 7 inch (17.78 cm) pieces of pipe.

Given the proper materials and supplies, the student will successfully assemble the sprinkler.

## VOCATIONAL CLUSTERS

Health Occupations

## ACTIVITY IMPLEMENTATION

### A. Description

This activity is designed to introduce the student to some basic processes of plumbing. A few plumbing fittings and a piece of plastic pipe are used to carry out this activity.

By using an activity guide, two students, working as a team, will follow step-by-step instructions, moving from one color area to the next. A checklist will be completed for each area and then corrected by the instructor before the student moves to the next color area. There are three areas to be completed before the project is finished. The necessary tools and equipment for successful completion of each color area will be located within that area.

Students will be given one student activity guide, one checklist booklet and the necessary material to complete the project.

### B. Safety

The safety rules will be stated under the color area they pertain to. Also, they will be listed on posters and will be hung within the area.

Red Area

1. Care should be taken when cutting with hacksaws.
2. Broken blades will not make a smooth cut.

Blue Area

1. Make sure drill is in "off" position when connecting drill cord to extension cord.
2. Long hair and loose clothing should be kept away from drill when it is in use.

Yellow Area

1. Cement is poisonous if taken internally.
2. Burns occur if cement comes in contact with eyes and skin.

### C. Materials

1. Audio Visual Equipment:
   Overhead Projector
   Screen or appropriate wall space.

2. Technical Equipment:

   5 hacksaws with extra blades
   25 rulers, 18 inch (45 cm)
   2 drills, ¼ inch
   5 vise-grip pliers
   2 extension cords
   2 metal pattern pipes, 3/4 x 7 inches (1.9 x 17.78 cm)

3 color area signs
1. Red Area
2. Blue Area
3. Yellow Area

3 operational signs
1. Cutting
2. Drilling
3. Assembling

3 plywood stands

3 dowel rods, 24 x ½ inch (.6 m x 1.27 cm)

3 boxes labeled as follows:
1. Metal pattern pipe, 3/4 x 7 inches (1.9 x 17.78 cm)
2. Rulers
3. Felt tip pens

Labels as follows:
1. Hacksaws
2. Drill with bit, ¼ inch
3. Vise-grip pliers
4. Extension cord
5. PVC cement

3. Expendable Materials:

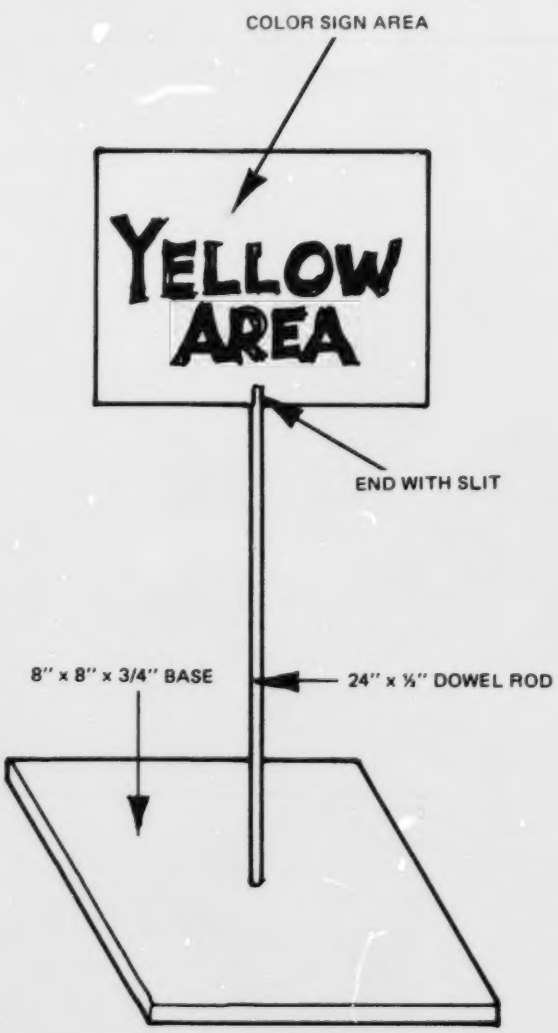
–PVC cement – 2 cans – Local plumbing company
–Ells – 1/2 inch (1.27 cm) diameter PVC, 4 per student – Local plumbing company
–Tees – 1/2 inch (1.27 cm) diameter PVC, 4 per student – Local plumbing company
–Caps – 1/2 inch (1.27 cm) diameter PVC, 3 per student – Local plumbing company
–Male adapters – 1/2 inch (1.27 cm) PVC, 1 per student – Local plumbing company
–Brass hose connector 1 per student – Local plumbing company
–PVC Pipe 1/2 inch (1.27 cm) diameter – 50 inches (1.27 m) per student – Local plumbing company
–Washers for hose connecter – 1 per student – Local plumbing company
–Cellophane tape – 1 roll – School supply store
–Drill bits (5) 1/16 inch – Hardware store
–Hacksaw blades (5) – Hardware store
–Felt-tip pens (5) – School supply store

D. **Preparation Prior to Class**

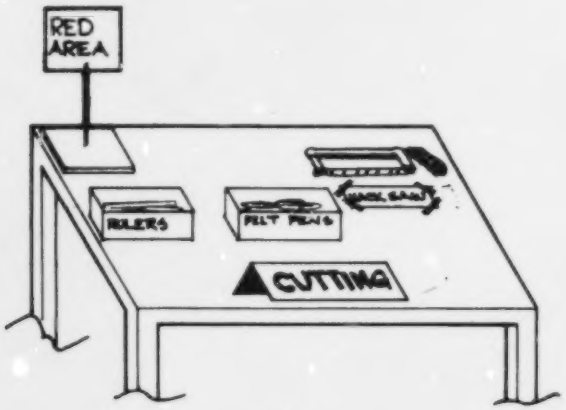
Obtain the following:
PVC cement
Ells
Tees
Caps
Male adjuster
Brass hose connector
Washer
PVC pipe
Screen or select appropriate wall space
Overhead projector

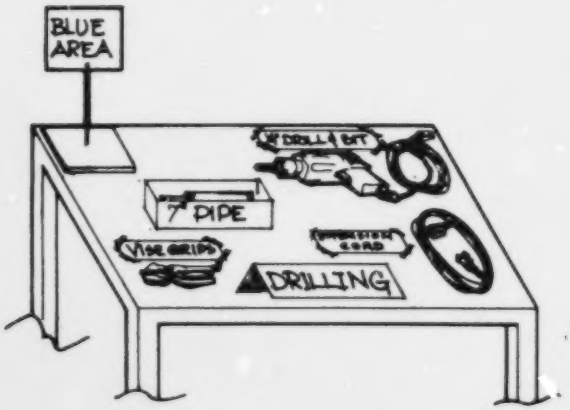
Locate three work areas in your classroom

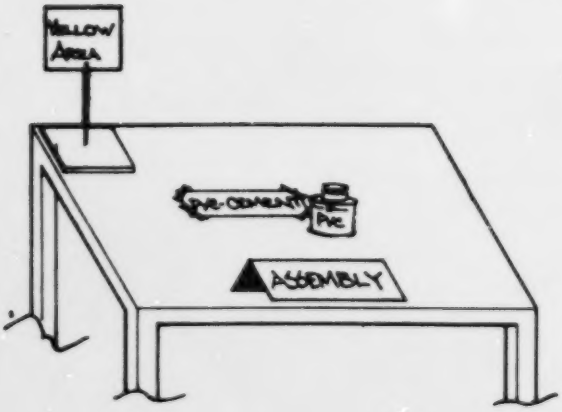
Assemble color area signs.



Set up each color area by using the following drawing as a guide. Tape laminated labels to the table.




Hang the safety posters in each area.

Cut 50 inches (1.27 m) of 1/2 inch (1.27 cm) PVC pipe for each student.

Duplicate the masters provided, student checkpoint booklet, and staple enough copies for the number of students you have.

Duplicate VIEW Fact Sheets.

Duplicate "Interview Survey Sheet". Make sure you have one for each student plus a few extra.

Put VIEW Fact Sheets and Interview Survey Sheets in a file folder and label "Follow-Up."

Choose the number of student activity guides needed for the class.

Assemble transparencies for introduction.

Set up overhead projector for viewing.

**E. During Class Sessions**

Distribute to each student one activity manual and one checkpoint booklet.

Introduce the activity:

This activity is derived from the plumbing industry. It is designed to introduce you to some basic principles involved in joining plastic (PVC) pipe and fittings to create a workable product, in this case, a garden sprinkler.

Transparency No. 1

Let's begin by looking at this flow chart of the different work areas we will use. Please note that each area is identified by a color. You will move from one area to the next until the activity is complete.

Transparency No. 2

...at each area, the Blue Area for example, all the tools necessary for successful completion of that area are located within that particular area...

Transparency No. 3

... Turn to the Blue Area in your Student Manual. Notice a drawing of that area and the step-by-step instructions. After successful completion of that area, you must answer the appropriate checklist; in this case, the "Blue Checkpoint"...

Transparency No. 4

...You will complete each answer and have the instructor check your work before proceeding to the next area...

Questions?

Transparency No. 5

...Safety will be emphasized by a poster in each color area. An example:

The Red Area

1. Care must be taken when cutting with hacksaws.
2. Broken blades will not make smooth cuts.

Transparency No. 6

... The Blue Area

1. Make sure drill is in "off" position when connecting drill cord to extension cord.
2. Long hair and loose clothing should be kept away from drill when it is in operation...

Transparency No. 7

... The Yellow Area

1. Cement is poisonous if taken internally.
2. Burns occur if cement comes in contact with eyes or skin...

... With these safety facts in mind, open your Student Activity Guide and begin. NOTE: DO NOT WRITE IN THIS MANUAL!

...Read each page and complete each activity before proceeding to the next.

To The Instructor:

Oversee the activity and advise only when needed.

F. Follow-up Activities

Below are several possibilities to be used as follow-up activities. Choose at least one follow-up activity or combine the four for a complete study.

Activity No. 1 – "Interview Survey Sheet." Using a copy of the survey sheet, the student will interview a person currently employed in the plumbing field. This survey sheet can be brought to class for a topic of discussion in Activity No. 2.

Activity No. 2 – "Class Discussion." Each student will describe his/her likes and dislikes of the activity completed. Discussion of activity No. 1 and Activity No. 4 could also be used.

Activity No. 3 – "VIEW Fact Sheets." Using the VIEW sheets, the student will answer questions about an occupation related to plumbing.

Activity No. 4 – Using the newspaper or possibly a local job service office, the student will locate and record advertisements for jobs relating to painting and decorating.

MASTERS FOR DUPLICATION

1. VIEW Fact Sheet
2. Interview Sheet
3. Student Checkpoint Booklet

## VIEW FACT SHEET

NAME _____ CLASS _____ OCCUPATION _____

A. List the advantages (good points) of this occupation (job).

B. List the disadvantages (bad points) of this occupation (job).

C. List three things you should know to do this occupation (job).
1.
2.
3.

D. What type of education should you get to be prepared (do) for this occupation (job)?

E. What courses must you take to go into this occupation (job)?

F. What do you think your future in this occupation (job) will be?

G. What wage can you expect in this occupation (job)?

H. What are the working hours of this occupation (job)?

I. To learn more about this occupation (job), write to:

J. Using a scale of 1 to 5, circle the number that measures your interest in this occupation (job) as a possible career.

I don't like it. 1 2 3 4 5 I like it.

## INTERVIEW SURVEY SHEET

Name of Interviewer: _____

Name of Person Interviewed: _____

Age: _____ Sex: _____

Title of Job: _____

Years Employed at that job: _____

(Total)

Likes of Job: 1. _____

2. _____

3. _____

Dislikes of Job: 1. _____

2. _____

3. _____

Hours of work per day (average): _____

Hourly Earnings: _____

Comments of Interviewer: _____

_____

_____

## CHECKPOINT RED AREA – CUTTING

Directions: Answer the following questions:

Check "yes" or "no"

1. Do you have eight pieces of pipe (PVC) each 3 inches (7.62 cm) long?
   Yes _____ No _____

2. Do you have two pieces of pipe (PVC) each 6 inches (15.24 cm) long?
   Yes _____ No _____

3. Do you have two pieces of pipe (PVC) each 7 inches (17.78 cm) long?
   Yes _____ No _____

4. Are the cut ends of your pipe relatively straight?
   Yes _____ No _____

5. After you have answered these questions, ask your instructor to check your work.

6. If your work is correct, move to the Blue Area. If not, return to Step 1 and repeat the activity and the checkpoint.

## CHECKPOINT – BLUE AREA – DRILLING

Directions: Answer the following questions:

Check "yes" or "no"

1. Did you drill holes in both pieces of 7 inch (17.78 cm) plastic pipe?
   Yes _____ No _____

2. Did you drill through both sides of each pipe?
   Yes _____ No _____

3. Did you clamp your two pieces of pipe together before you drilled?
   Yes _____ No _____

4. After you have completed these questions, ask your instructor to check your answers.

5. If you have successfully completed these questions move to the "Yellow Area." If you need to do more work, repeat the steps and the checkpoint.

## CHECKPOINT – YELLOW AREA – ASSEMBLY

Directions: Answer the following questions.

Check "yes" or "no"

1. Did you have any pieces left over?
   Yes _____ No _____

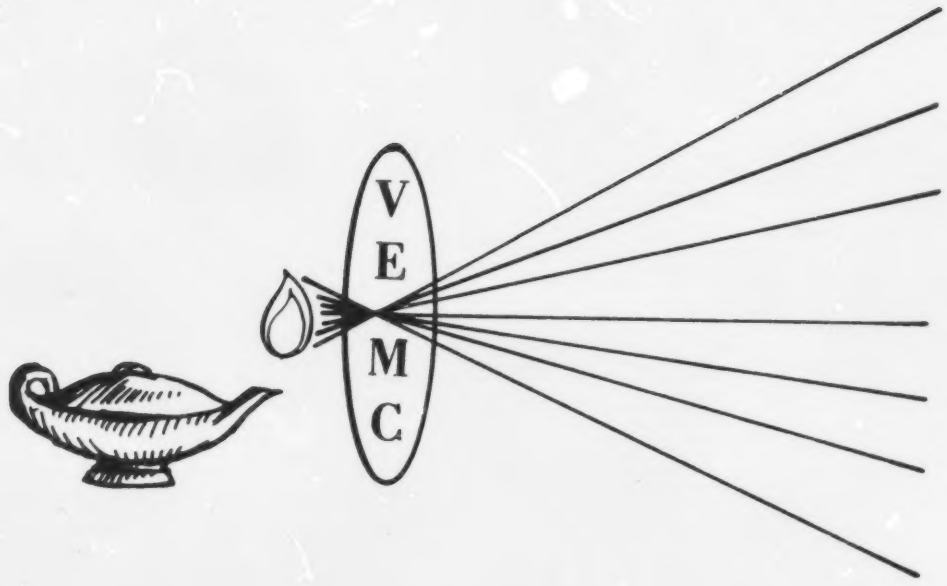
2. Did you align the pieces so that your product appeared straight and even?
   Yes _____ No _____

3. Did you place the sprinkler holes upward so that water will spray upward and to the side rather than downward?
   Yes _____ No _____

4. If you have completed these questions, ask your instructor to check your work.

5. If you have successfully completed your work, sign your name to this booklet and return it to your instructor.

6. If additional work is necessary redo the steps and the checkpoint.

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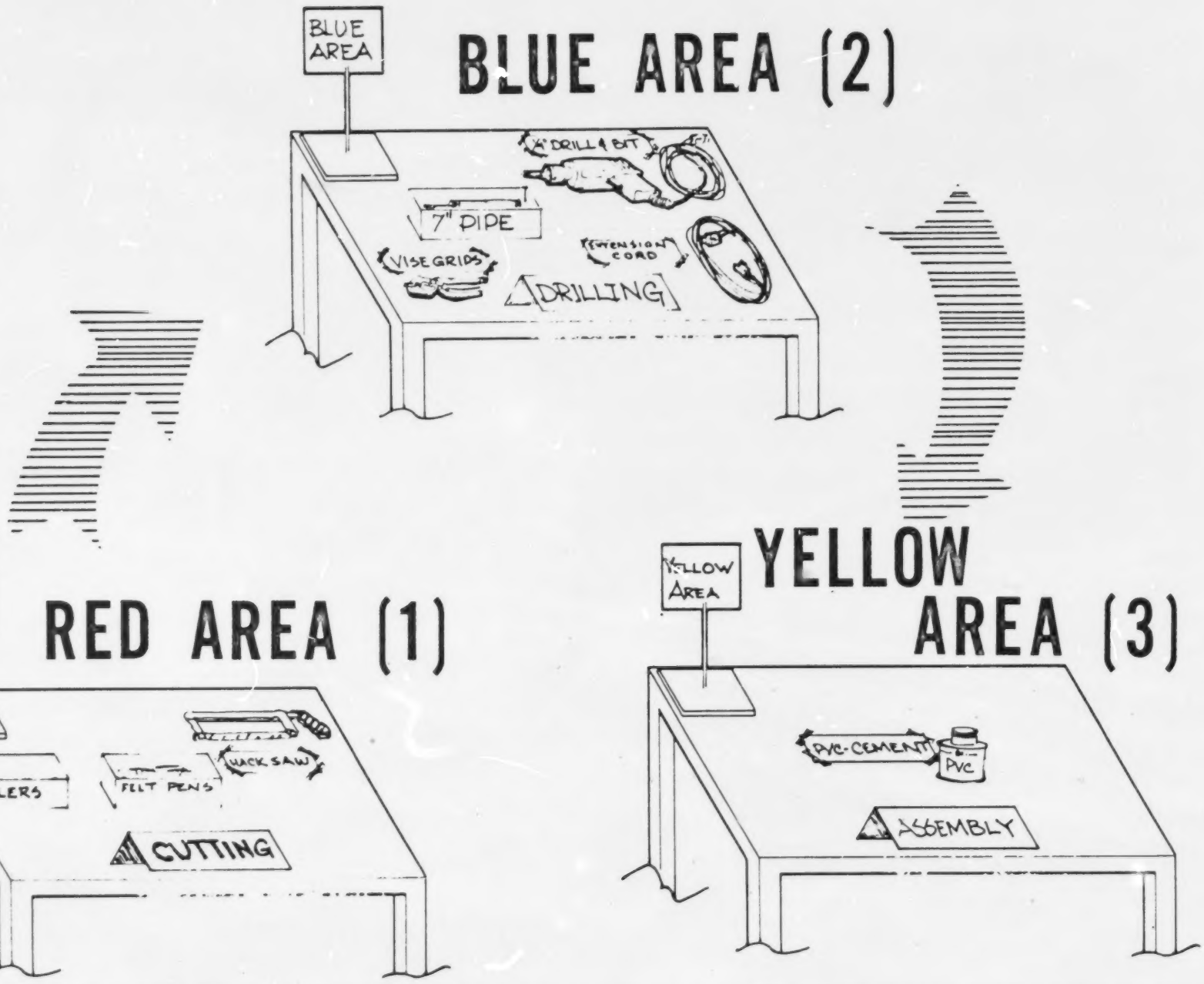


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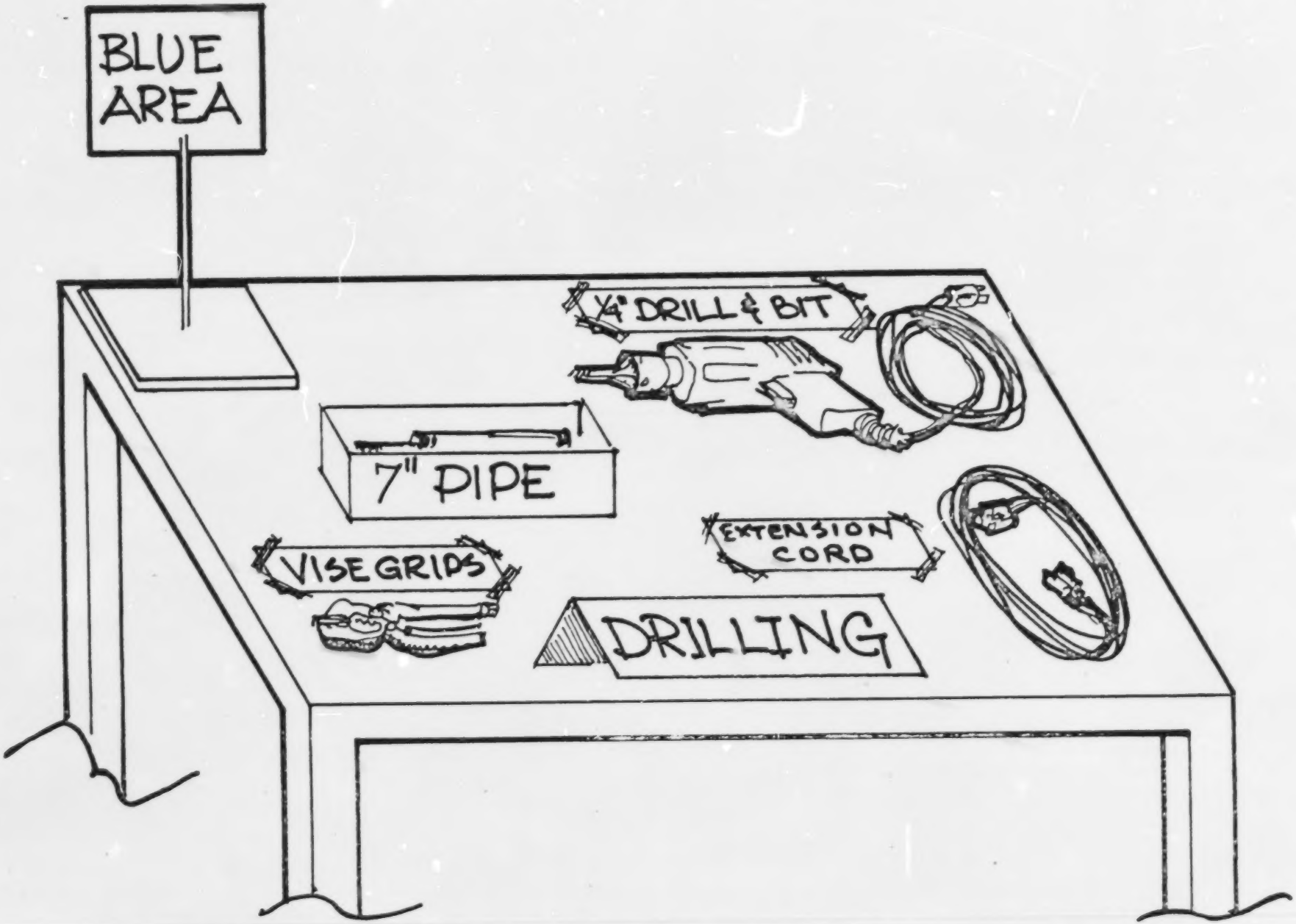
Transparency No. 1

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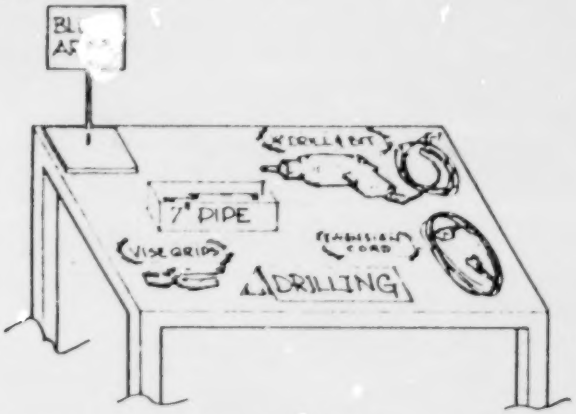
Transparency No. 2

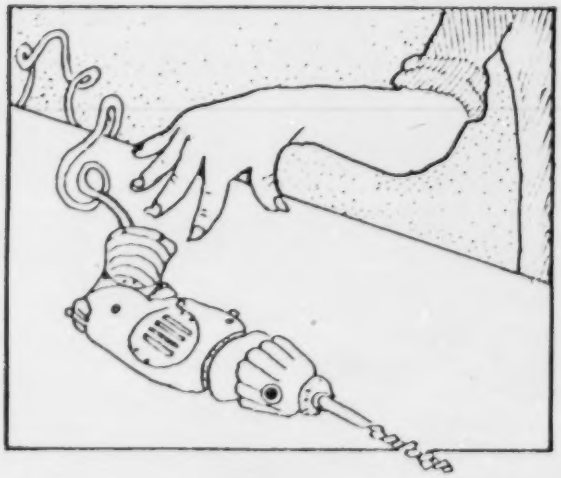
# Instructional Objective II

Given the necessary tools and equipment, the students will successfully drill the spray holes in the two 7 inch (17.78 cm) pieces of pipe.

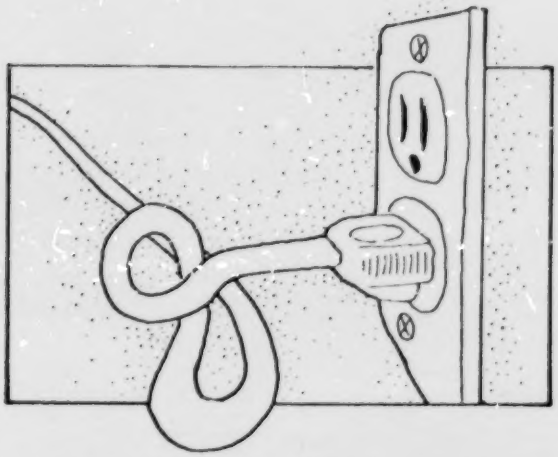



STEP 1 – Move to the Blue Area and note the necessary tools to use.

1. 1/4 inch (.64 cm) drill with 1/16 inch (.16 cm) drill bit
2. 3/4 inch (1.9 cm) PVC pipe for pattern
3. Vise grip pliers
4. Extension cord



STEP 2 – Secure one 1/4 inch (.64 cm) drill and bit from the Blue Area.



STEP 3 – Plug the extension cord into a wall outlet.

STEP 4 – The drill should be in the "off" position.

STEP 5 – Plug drill cord into extension cord.

Transparency No. 3

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## CHECKPOINT – BLUE AREA – DRILLING

Transparency No. 4

Directions: Answer the following questions:

Check "yes" or "no"

1. Did you drill holes in both pieces of 7 inch (17.78 cm) plastic pipe?
   Yes _____ No _____

2. Did you drill through both sides of each pipe?
   Yes _____ No _____

3. Did you clamp your two pieces of pipe together before you drilled?
   Yes _____ No _____

4. After you have completed these questions, ask your instructor to check your answers.

5. If you have successfully completed these questions move to the "Yellow Area." If you need to do more work, repeat the steps and the checkpoint.

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# YELLOW AREA - SAFETY

1. CEMENT IS POISONOUS
   DO NOT PUT IN MOUTH

2. DO NOT GET CEMENT IN EYES
   OR ON SKIN - IT WILL BURN

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Transparency No. 5

# BLUE AREA - SAFETY

1. BE SURE DRILL IS OFF BEFORE CONNECTING POWER CORD TO POWER SUPPLY

2. KEEP LONG HAIR AND LOOSE CLOTHING AWAY FROM DRILL WHEN OPERATING IT

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# RED AREA - SAFETY

1. CARE SHOULD BE TAKEN WHEN USING THE HACK SAW

2. BROKEN BLADES MAKE BAD CUTS



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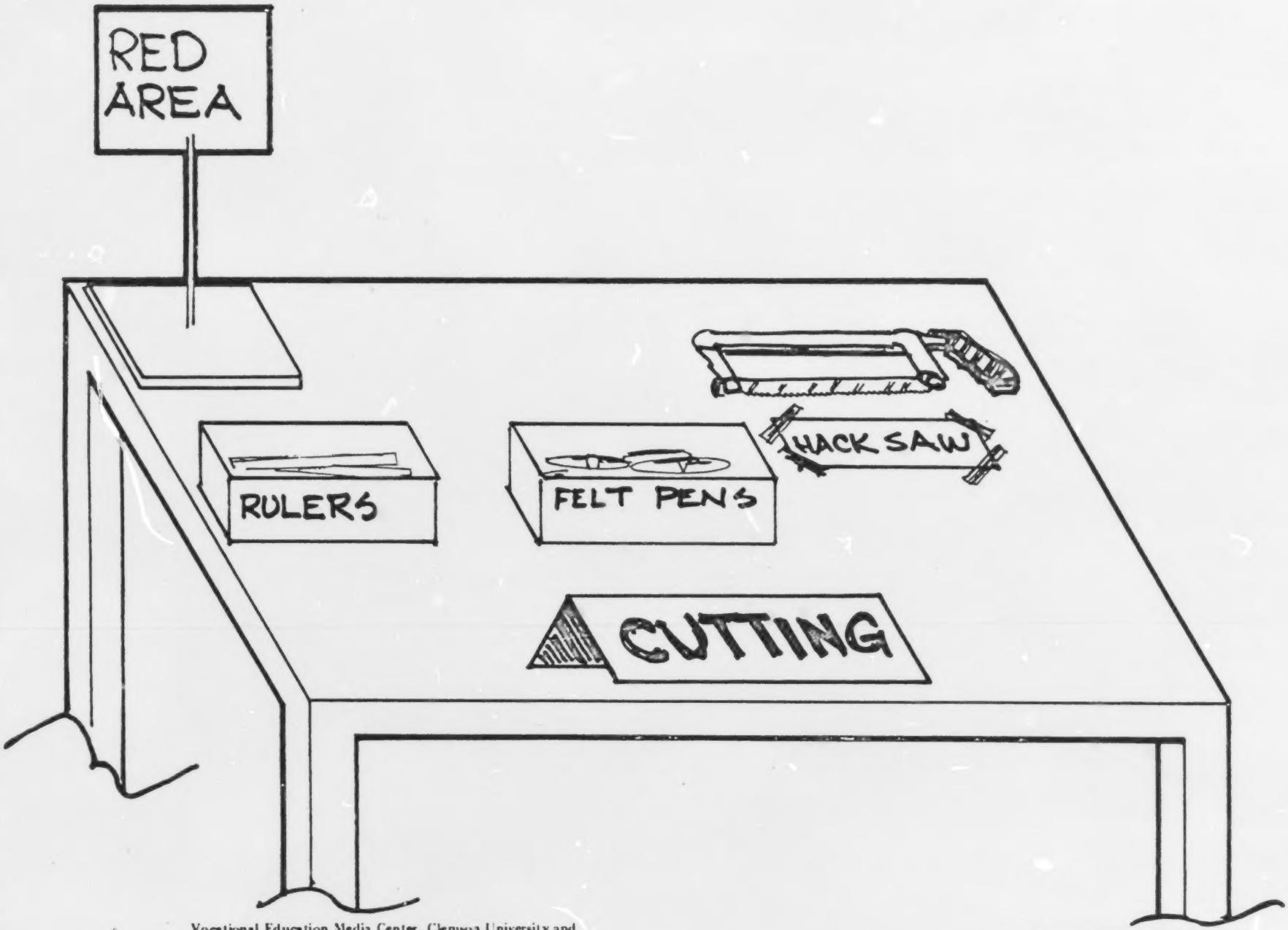


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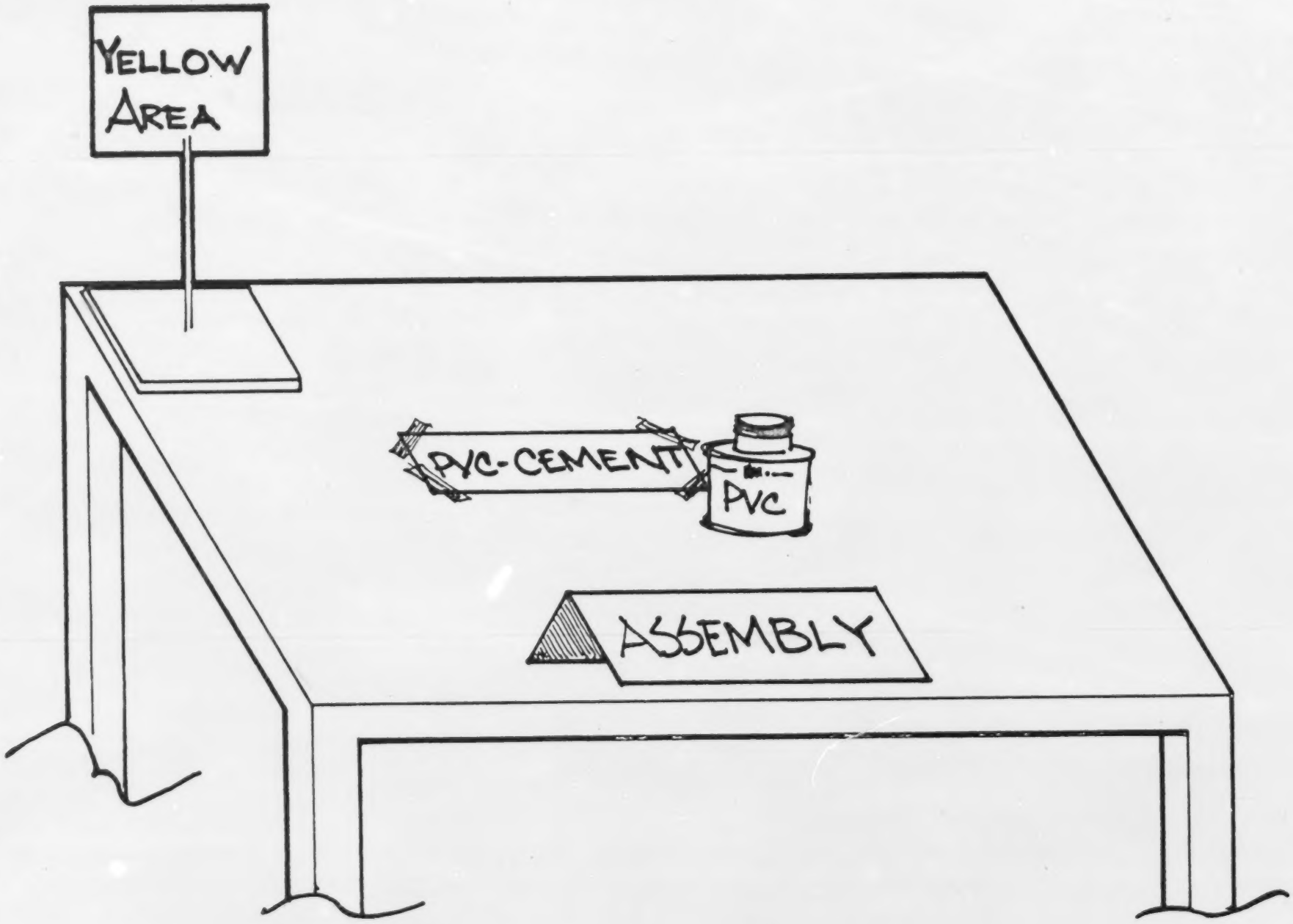




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T & I – PLUMBING

KIT NO. 67

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2. Please do not write on the transparency with a grease or wax pencil. If you wish to emphasize something, place a clear sheet of plastic over the transparency and write on the clear sheet. This will prevent possible abrasion to the transparency.

3. Store this folder in a good filing cabinet. If you wish to mount them you may. Overlays should be hinged together to start with.

4. Store in a dry place.

5. Yes, the plastic will bend, tear and scratch – if you let it be abused. Cared for properly, it will last for many years.

6. To separate the transparency from the slip sheet, grasp the transparency in one hand and the slip sheet in the other, near the glue strip, and carefully pull the two apart.

# T & I – PLUMBING

Kit No. 67

## STUDENT

## LEARNING ACTIVITY GUIDE

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## INTRODUCTION

This activity is focused around a cluster of work called "Plumbing." Plumbing is a vocational area with which most of us are familiar and use each day. This activity is designed to employ basic plumbing fittings and the principles of joining to create a useful product. The type of fittings and pipe used is called PVC – (Polyvinyl Chloride) or plastic hardware.

Using this step-by-step instructional guide, you will follow several simple assembly methods to complete this plumbing activity. The end product is a garden sprinkler.

## GOALS

The student will become familiar with the processes involved in cutting plastic (PVC) plumbing pipe.

The student will learn how to join pipe and fittings to create various angles involved in plumbing.

The student will learn how to join several fittings with pipe to create a useful product.

## DIRECTIONS

This manual is designed to be used as a self-instructional booklet. It is advised, but not necessary, that you work in pairs throughout this activity.

You will proceed, using this guide, following a general group meeting between the class and the instructor. This meeting will include discussion of safety rules to follow and the stages for successful completion of your project.

Your activity is divided into three major areas. Each of these areas is color coded. You will find all of the tools and materials necessary for completion of that color area located within that particular area.

You must follow all the directions and the step-by-step instructions in the guide for successful completion of this activity. At no time should you move to the next step without successfully completing each objective and checkpoint.

## MATERIALS

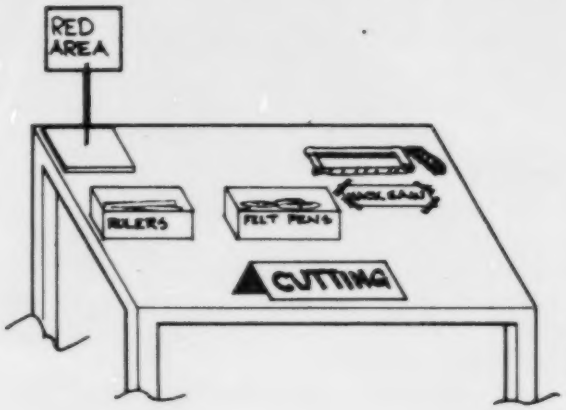
1 Instruction manual
1 Checkpoint booklet
1 Piece of 1/2 inch (1.27 cm) (PVC) pipe – 50 inches (1.27 m) long
4 Tees, 1/2 inch (1.27 cm) PVC
4 Ells, 1/2 inch (1.27 cm) PVC
3 Caps, 1/2 inch (1.27 cm) PVC
1 Male adaptor threaded 1/2 inch (1.27 cm) PVC
1 Brass hose connector
1 Washer for hose connector

## PROGRAMMED TEXT

**Red Area – Cutting**

### Instructional Objective 1

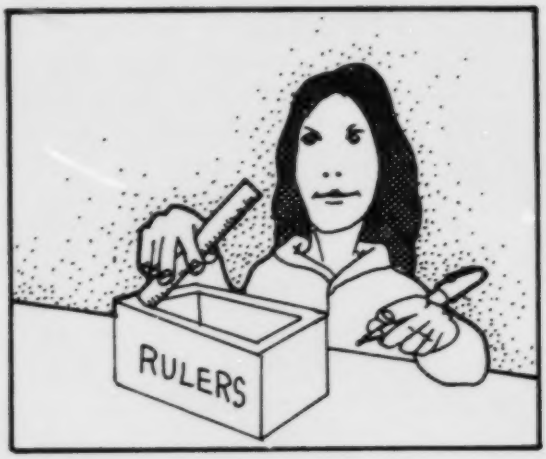
Given the necessary tools and equipment, the students will lay out and cut all of the necessary lengths of 1/2 inch (1.27 cm) PVC pipe.



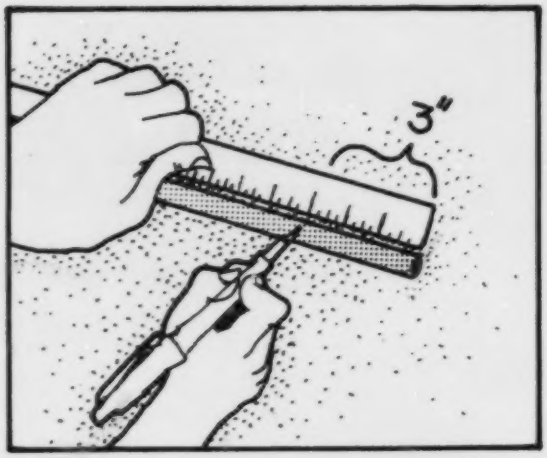

STEP 1 – Move to the Red Area and note the tools necessary to use.

1. Hacksaws
2. Rulers
3. Felt-tip pens

STEP 2 – Read safety poster.

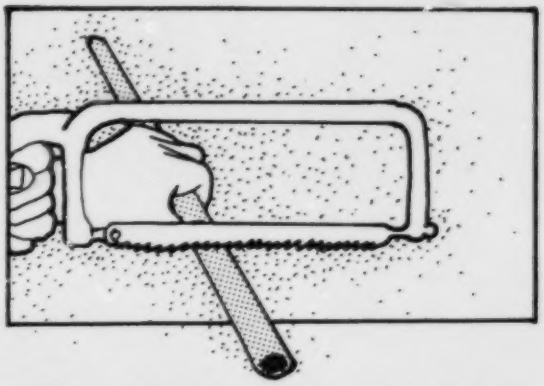



STEP 3 – Secure one ruler and felt-tip pen from red area.

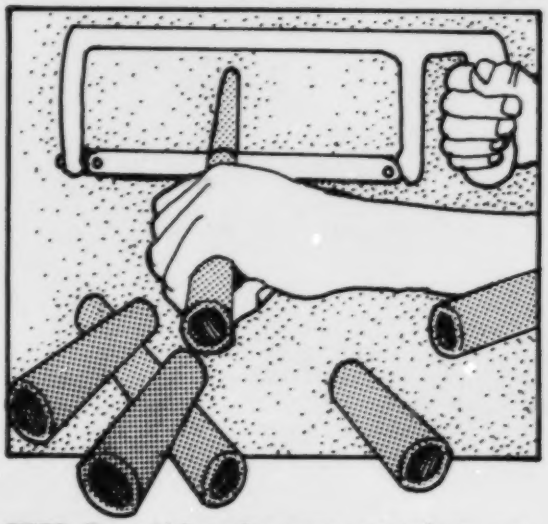



STEP 4 – With ruler and pencil, place a mark at 3 inches (7.62 cm) along the pipe.

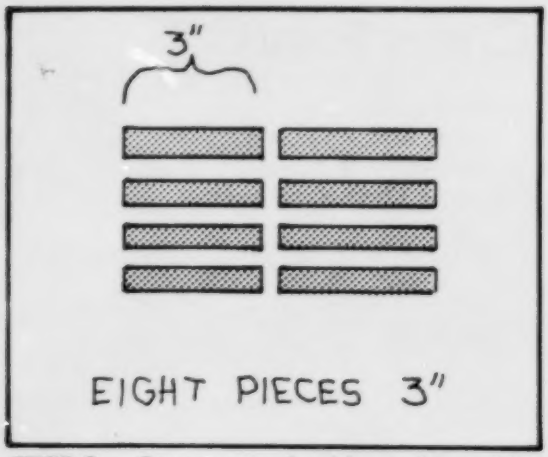
STEP 5 – Check to make sure you have measured correctly.



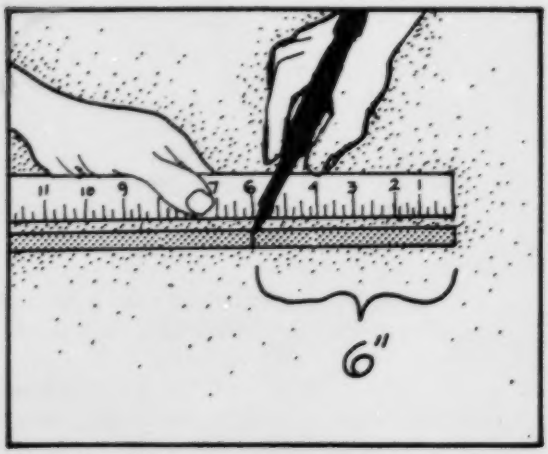
STEP 6 – Using the hacksaw, cut your pipe at the 3 inch (7.62 cm) mark.



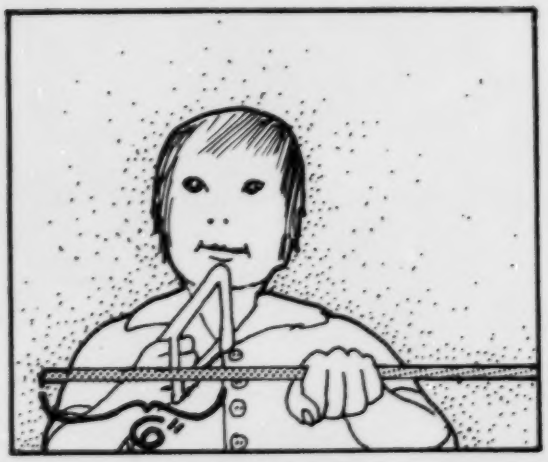
STEP 7 – Using the same procedure, cut seven more pieces of pipe.



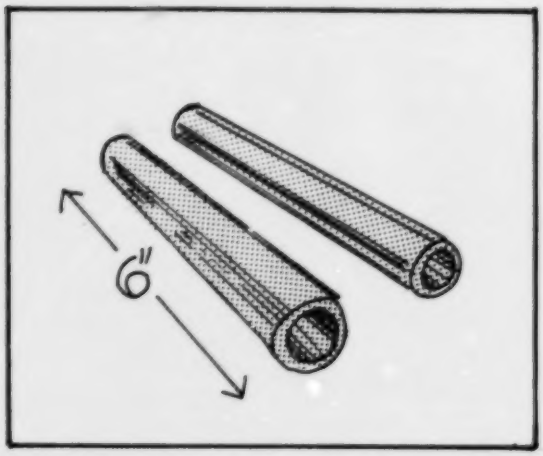

STEP 8 – Count; you should now have eight pieces, each 3 inches (7.62 cm) long. These eight pieces are called "connector pieces."



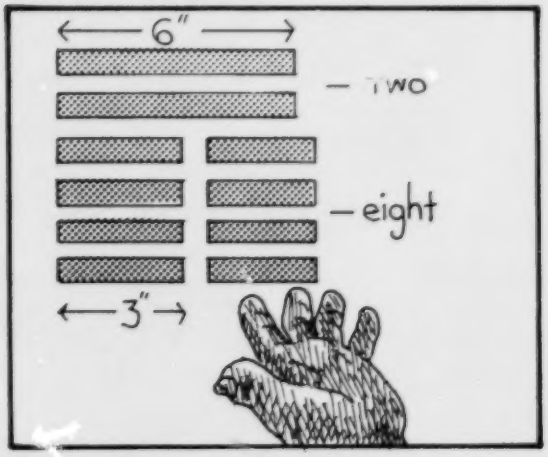

STEP 9 – With your ruler and pencil, place a mark at 6 inches (15.24 cm) on your pipe.



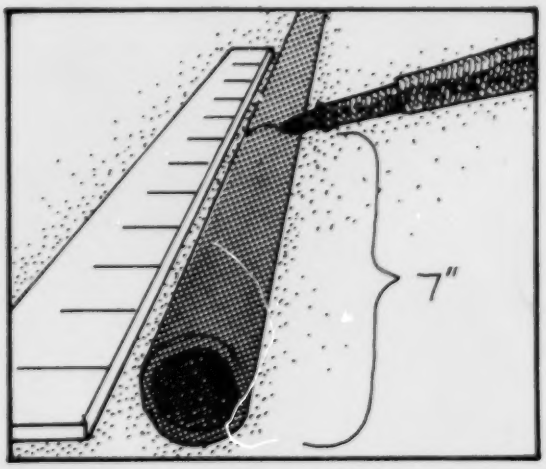

STEP 10 – With hacksaw, cut pipe at the 6 inch (15.24 cm) mark.



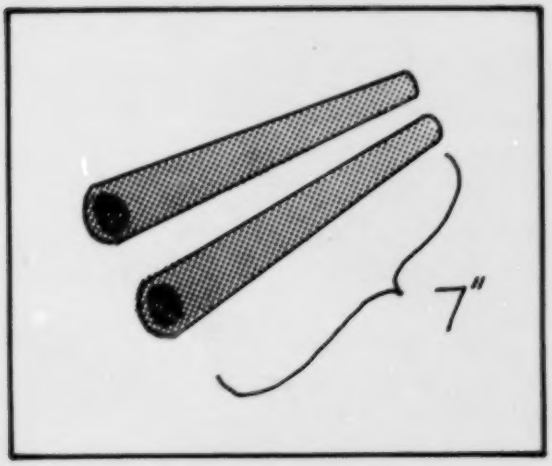

STEP 11 – Measure and cut another piece of 6 inch (15.24 cm) pipe. These two pieces are called the "base pieces."



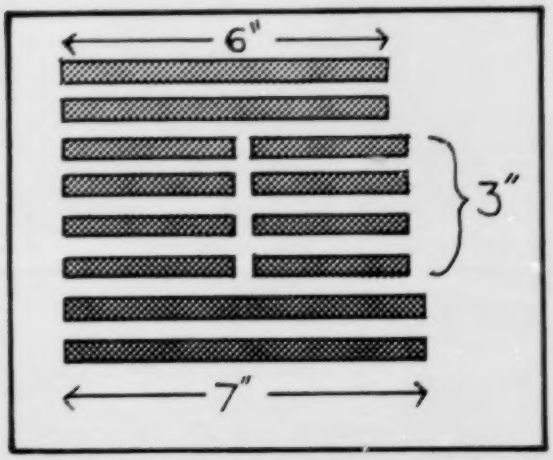

STEP 12 – You should now have eight pieces 3 inches (7.62 cm) long and two pieces 6 inches (15.24 cm) long.




STEP 13 – From the remaining plastic pipe, measure and cut two pieces 7 inches (17.78 cm) long.




STEP 14 – These two 7 inch (17.78 cm) pieces are called the "sprayers."




STEP 15 – Your total number of pieces of pipe should be: eight pieces 3 inches (7.62 cm) long, two pieces 6 inches (15.24 cm) long, and two pieces 7 inches (17.78 cm) long.

## Check Point

**CHECKPOINT**

**Red Area – Cutting**

Answer the following questions in the Red Area Checkpoint booklet.

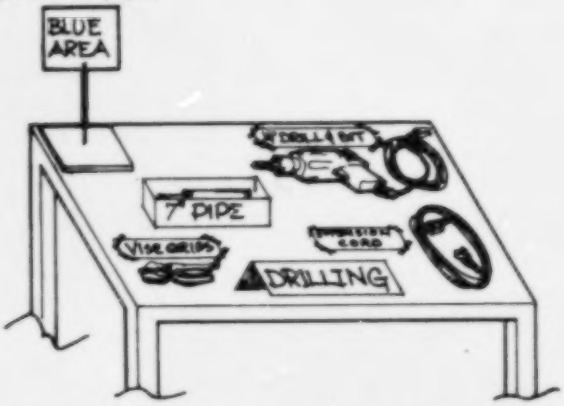
DO NOT WRITE IN THIS MANUAL

Check "yes" or "no"

1. Do you have eight pieces, each 3 inches (7.62 cm) long?
   Yes _____ No _____
2. Do you have two pieces, each 6 inches (15.24 cm) long?
   Yes _____ No _____
3. Do you have two pieces, each 7 inches (17.78 cm) long?
   Yes _____ No _____
4. Are the ends of your pipe relatively straight?
   Yes _____ No _____
5. After you have answered these questions ask your instructor to check your work.
6. If your work is correct, move to the Blue Area. If not, return to step 1 and repeat the activity and the checkpoint.

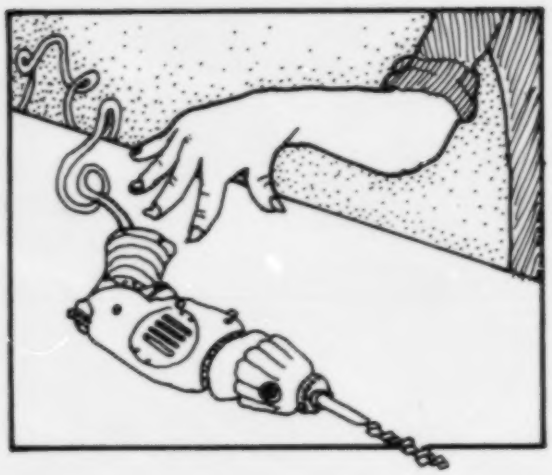
## Instructional Objective II

Given the necessary tools and equipment, the students will successfully drill the spray holes in the two 7 inch (17.78 cm) pieces of pipe.

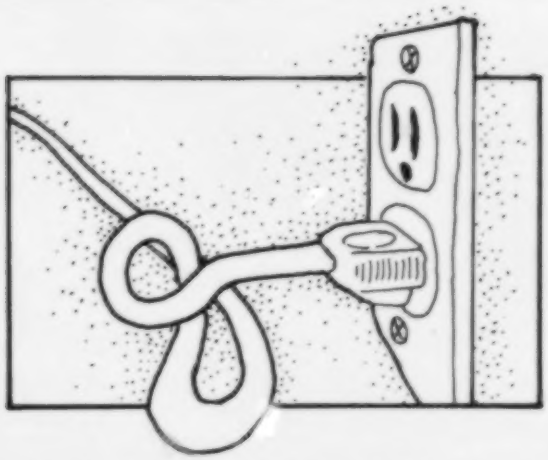



STEP 1 – Move to the Blue Area and note the necessary tools to use.

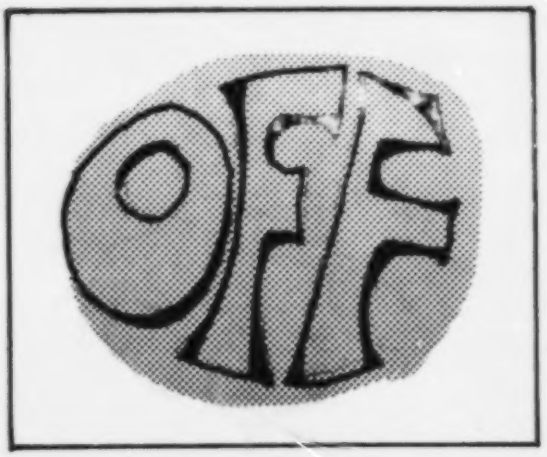
1. 1/4 inch (.64 cm) drill with 1/16 inch (.16 cm) drill bit
2. 3/4 inch (1.9 cm) PVC pipe for pattern
3. Vise-grip pliers
4. Extension cord



STEP 2 – Secure one 1/4 inch (.64 cm) drill and bit from the Blue Area.

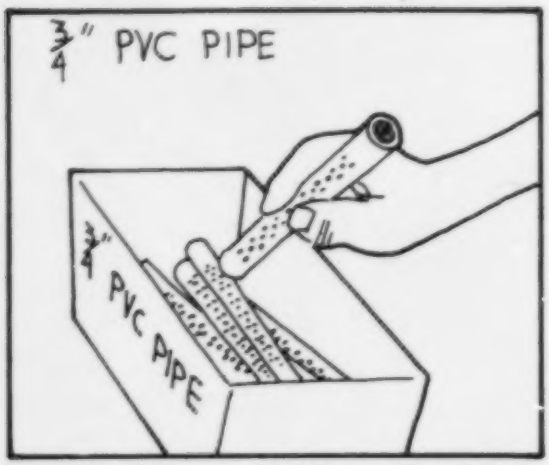


STEP 3 – Plug the extension cord into a wall outlet.

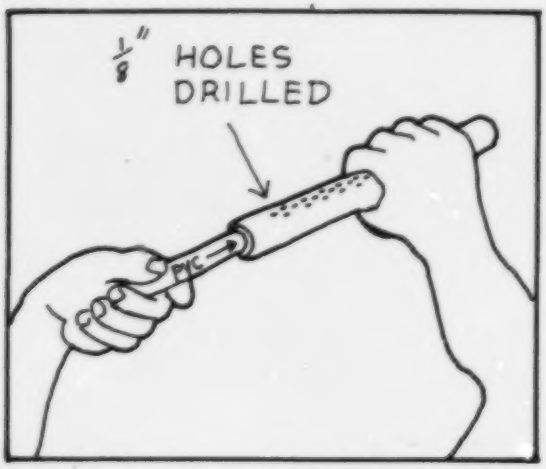



STEP 4 – The drill should be in the "off" position.

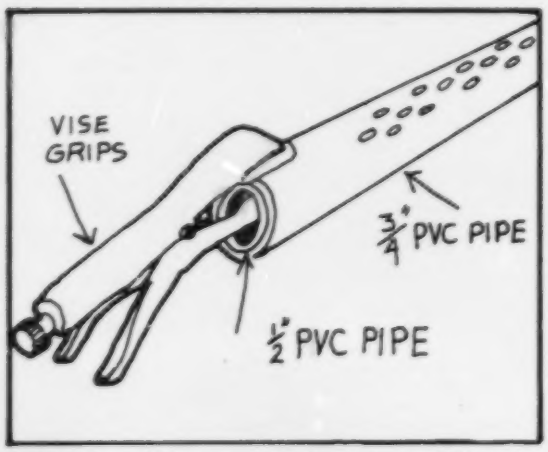
STEP 5 – Plug drill cord into extension cord.



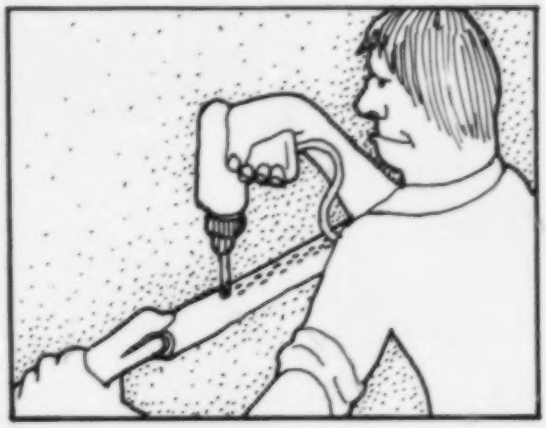

STEP 6 – Secure one 3/4 inch (.19 cm) PVC piece of pipe from the Blue Area.



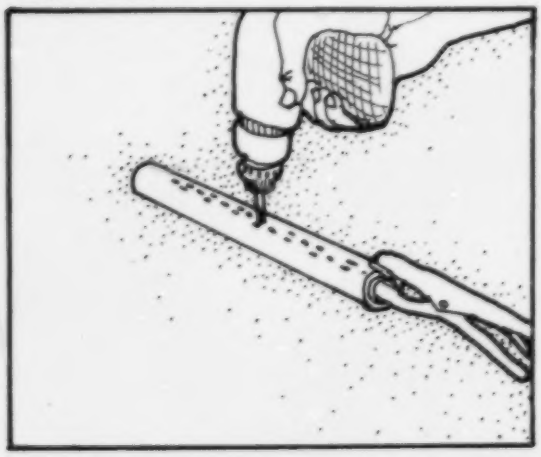

STEP 7 – Insert one 7 inch (17.78 cm) piece of PVC pipe inside 3/4 inch (1.9 cm) PVC pipe until ends become flush (even).



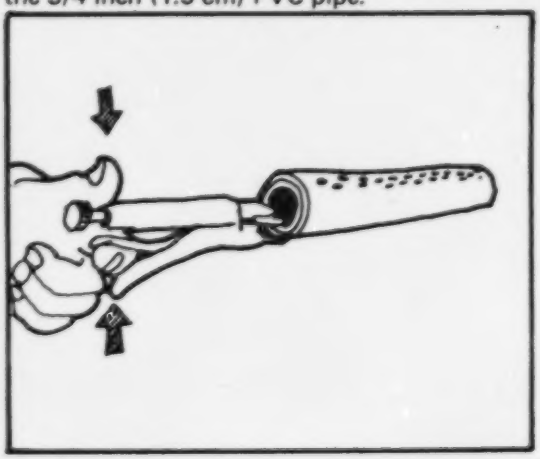

STEP 8 – Clamp one end of your 3/4 inch (1.9 cm) PVC pipe and plastic PVC pipe with the vise-grip pliers. This will prevent the pipe from slipping.



STEP 9 – With a 1/4 inch (.64 cm) hand drill and bit, drill through the plastic pipe by using the holes located in the 3/4 inch (1.9 cm) PVC pipe pattern as a guide. NOTE: Be careful not to drill through the other side of the plastic pipe.

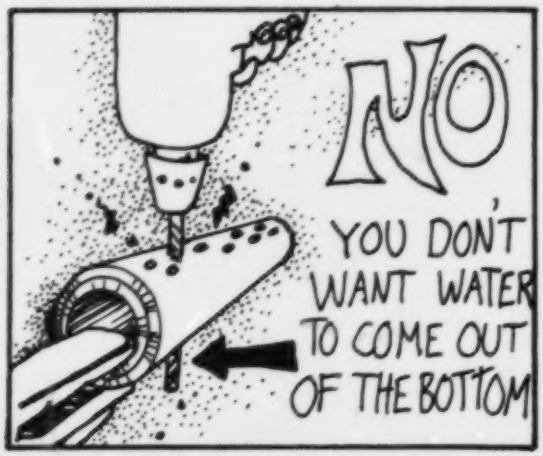


STEP 10 – Drill through each hole located in the 3/4 inch (1.9 cm) PVC pipe.

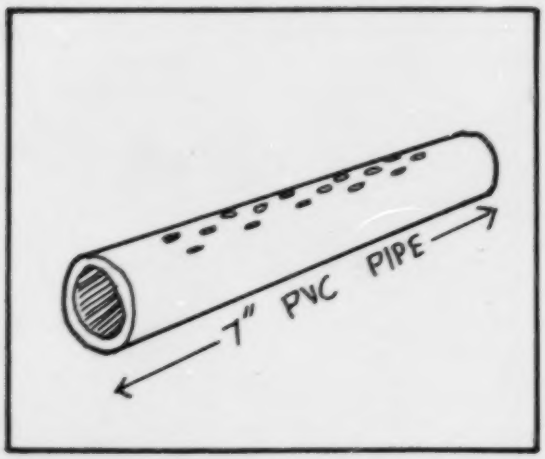


STEP 11 – Unclamp the vise-grip pliers and remove the plastic PVC pipe.

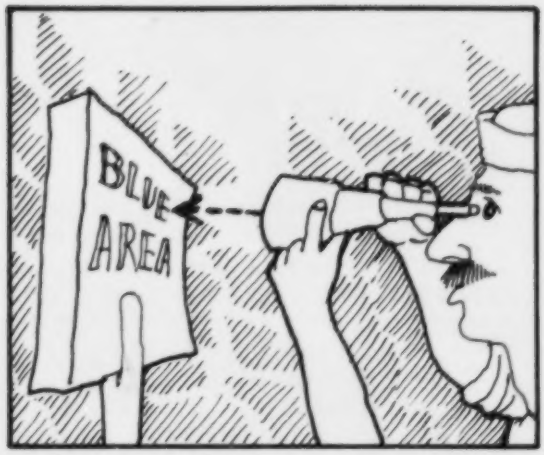
STEP 12 – Insert the other 7 inch (17.78 cm) piece of plastic pipe in 3/4 inch (1.9 cm) PVC pipe.




STEP 13 – Clamp and drill in the same manner as you did the first piece. NOTE: Don't drill through both sides of the pipe.




STEP 14 – The plastic 7 inch (17.78 cm) PVC pipe should look like this.




STEP 15 – Return drill, bit, pipe and extension cord to the Blue Area.

## Check Point

**Blue Area – Drilling**

Answer the following questions in the Blue Area Checkpoint booklet.

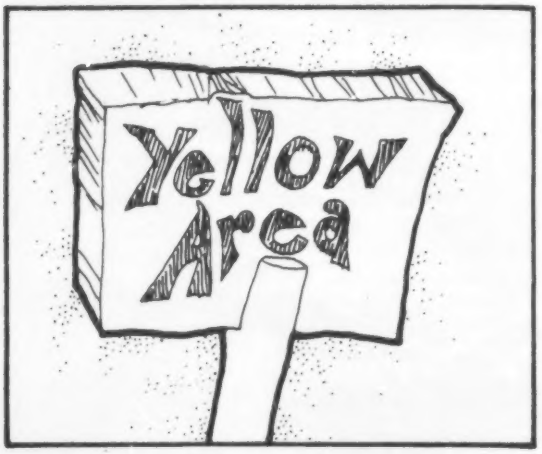
DO NOT WRITE IN THIS GUIDE

Check "yes" or "no"

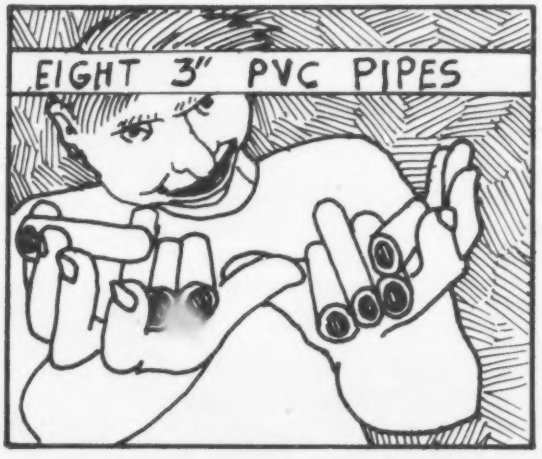
1. Did you drill holes in both pieces of 7 inch (17.78 cm) plastic pipe?
   Yes _____ No _____
2. Did you drill through both sides of the pipe?
   Yes _____ No _____
3. Did you clamp the two pieces of pipe together before drilling?
   Yes _____ No _____
4. After you have completed these questions, ask your instructor to check your answers.
5. If you have successfully completed these questions, move to the Yellow Area in your student activity guide. If you need to do more work, repeat the steps and the checkpoint.

## Instructional Objective III

Given the proper materials and supplies, the student will successfully assemble the sprinkler. Get the approval of your instructor before beginning this phase of the activity.

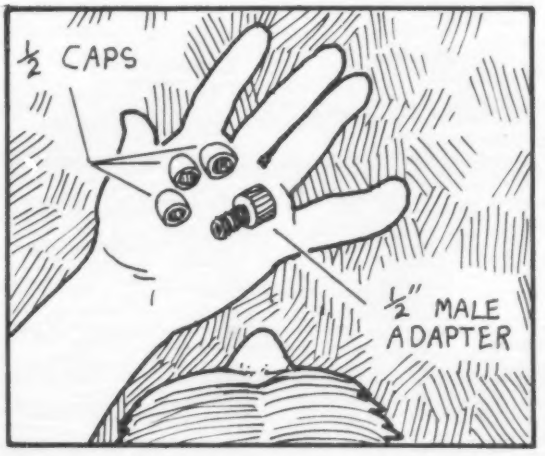



STEP 1 — Move to the Yellow Area and secure a can of PVC cement. NOTE: This cement is for a permanent bond. It is suggested that you assemble your pieces then disassemble them before cementing. This allows you to check and adjust your work before gluing. This cement is fast acting and forms a permanent bond.

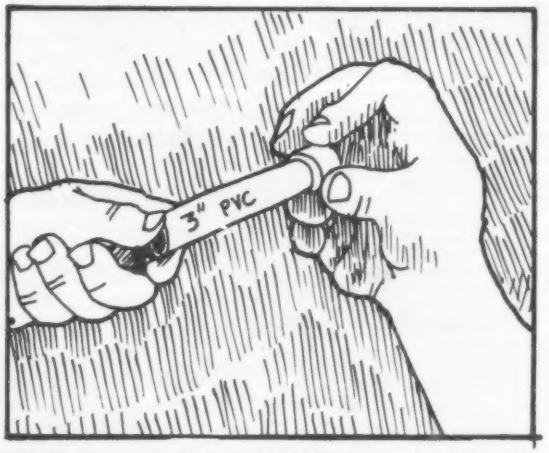



STEP 2 — Secure your 3 inch (7.62 cm) pieces of pipe. You should have eight of these "connector pieces."

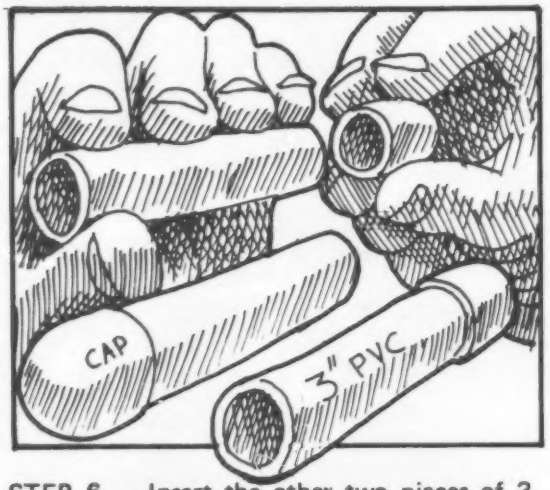
STEP 3 — If you wish to make this sprinkler permanent, apply a coat of cement to each end of the pipe before inserting it into the fittings.



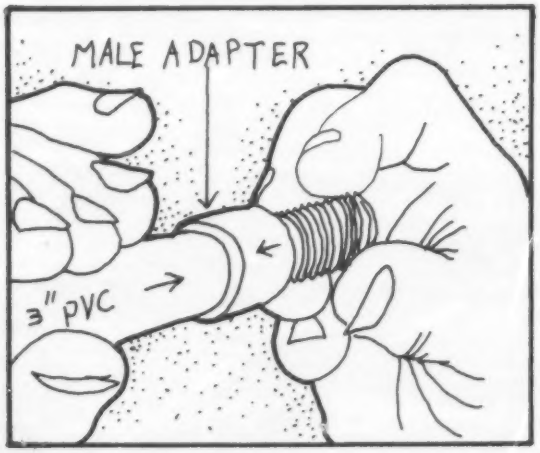

STEP 4 — Secure your three 1/2 inch (1.27 cm) PVC caps and one 1/2 inch (1.27 cm) male adapter.



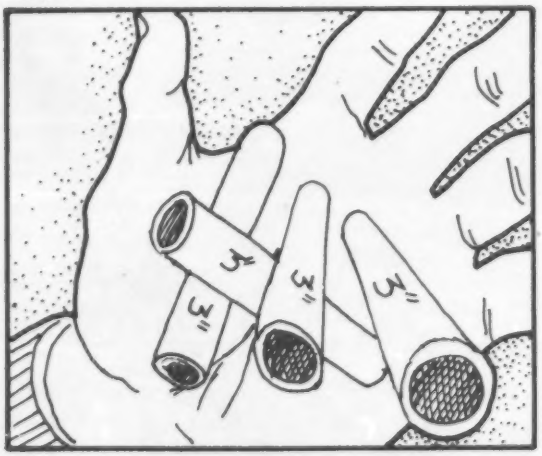

STEP 5 — Insert a 3 inch (7.62 cm) piece of pipe into a cap.



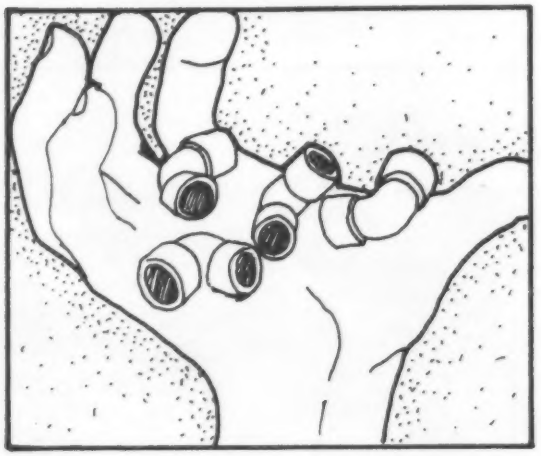

STEP 6 – Insert the other two pieces of 3 inch (7.62 cm) pipe into caps.



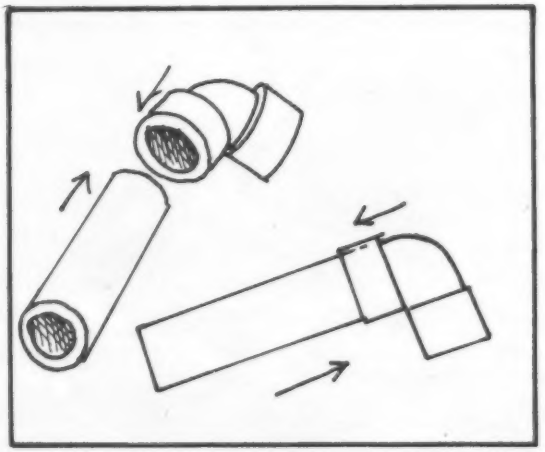

STEP 7 – Insert one 3 inch (7.62 cm) piece of pipe into the 1/2 inch (1.27 cm) male adapter.



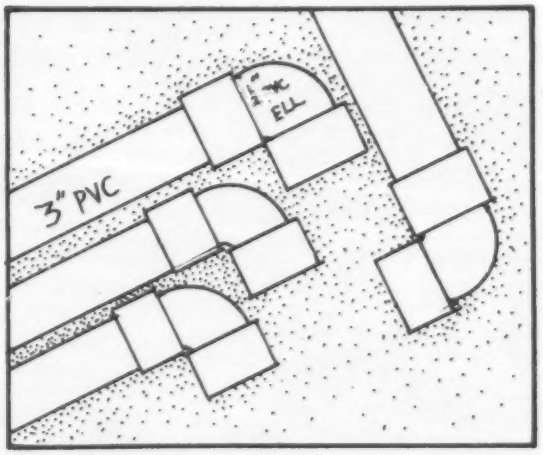

STEP 8 – Secure the four other pieces of 3 inch (7.62 cm) pipe.



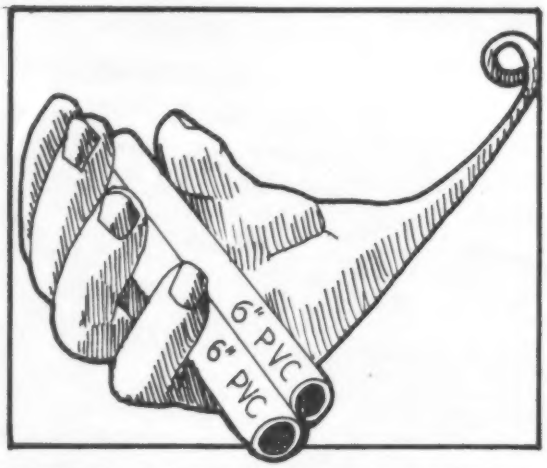
STEP 9 – Secure four 1/2 inch (1.27 cm) PVC ells.



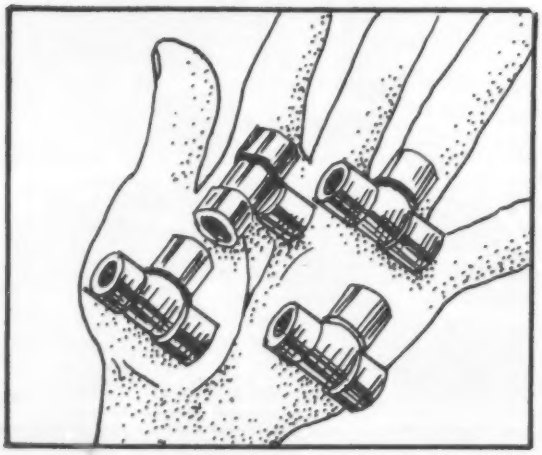
STEP 10 – Insert the four remaining 3 inch (7.62 cm) pieces of pipe into one end of each ell.



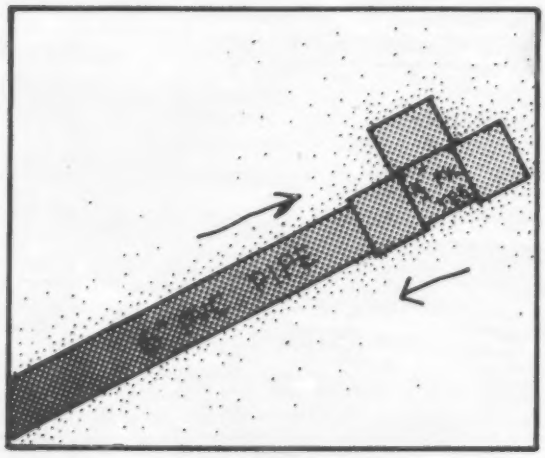

STEP 11 – You should have four ells with one piece of pipe in each.



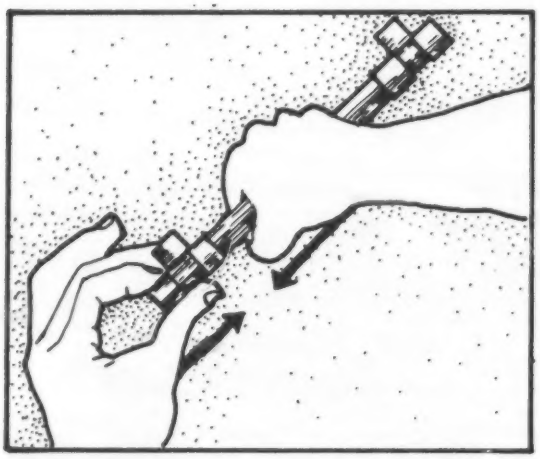

STEP 12 – Secure the two pieces of 6 inch (15.24 cm) pipe.



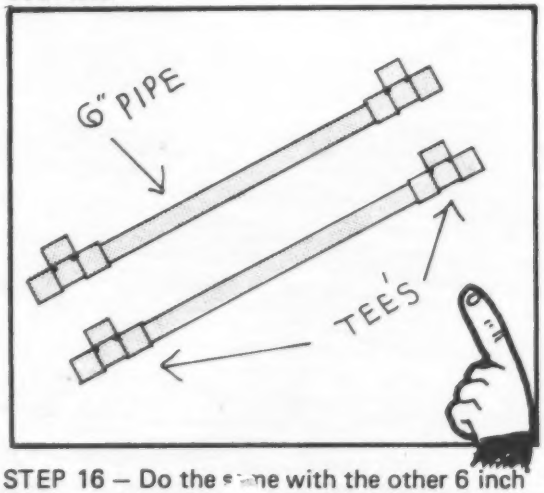
STEP 13 – Secure the four 1/2 inch (1.27 cm) PVC tees.



STEP 14 – Insert one 6 inch (15.24 cm) pipe into one end of one tee.

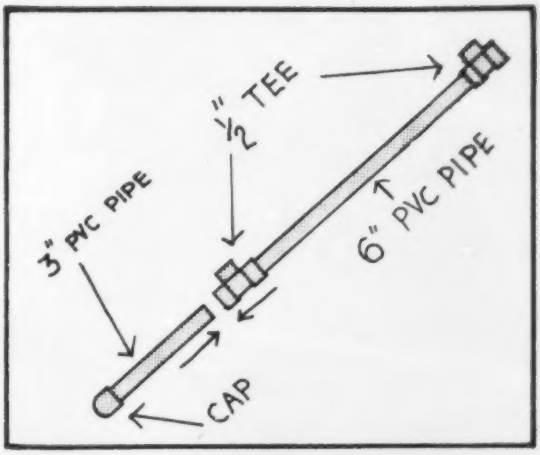


STEP 15 – Insert the other end of the 6 inch (15.24 cm) pipe into another tee, lining up both tees.

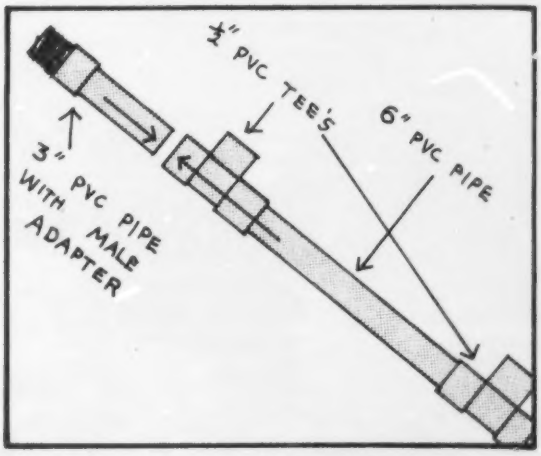



STEP 16 – Do the same with the other 6 inch (15.24 cm) piece of pipe and the remaining two tees. NOTE: Test to see if the tees are lined up by laying them on a table top. Twist the tees until they are in line.

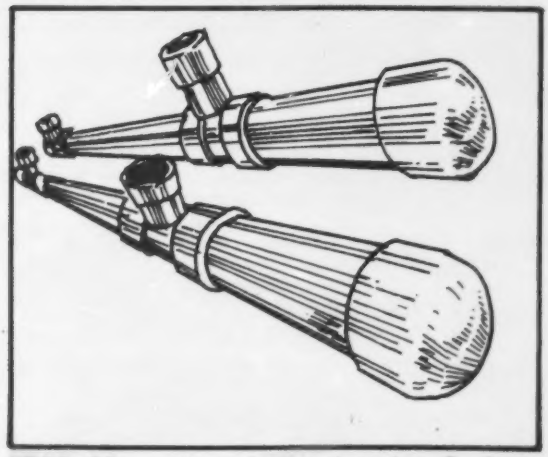
STEP 17 – Your work should look like this.



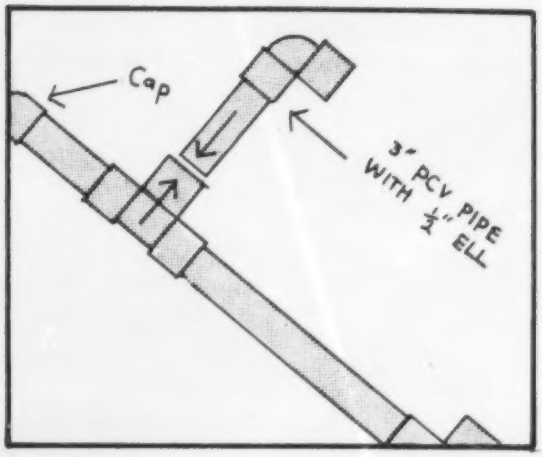

STEP 18 – Insert one 3 inch (7.62 cm) piece of pipe with cap on it into an open end of one tee.



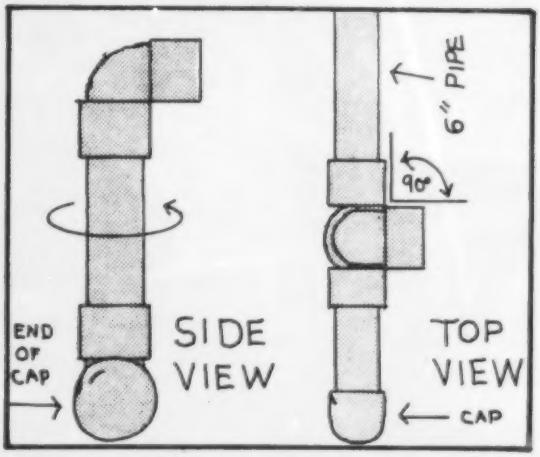

STEP 19 – Insert a 3 inch (7.62 cm) piece of pipe with the 1/2 inch (1.27 cm) male adapter on it into another tee.



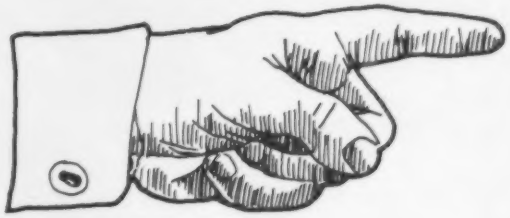
STEP 20 – Now, insert the other 3 inch (7.62 cm) pieces of pipe with caps on them into the remaining two tees.



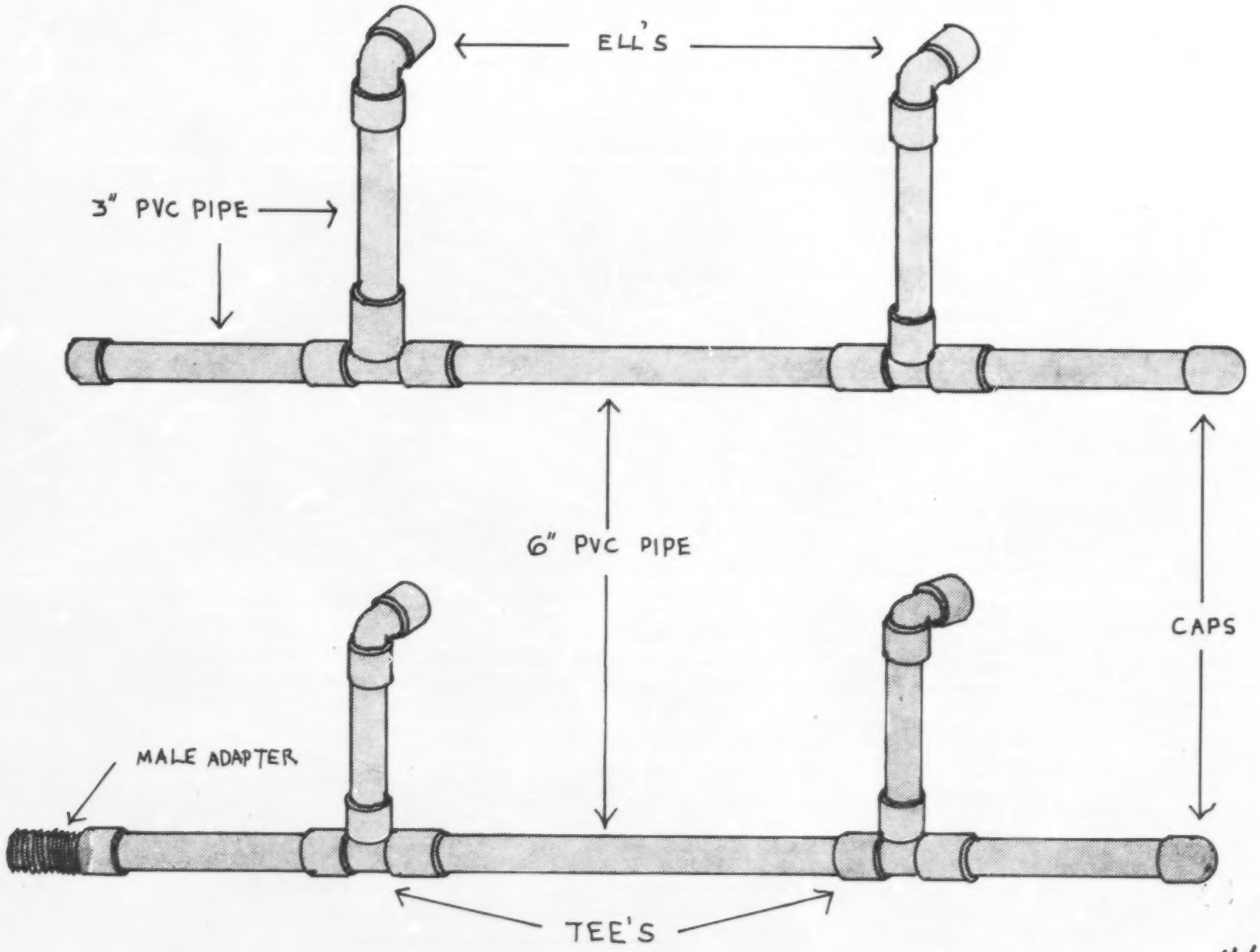

STEP 21 – Next, insert the 3 inch (7.62 cm) pieces of pipe with the ells attached to them into the top part of the four tees.




STEP 22 – Twist the ells so they appear as 90 degree angles to the caps.



STEP 23 – Your work should now look like this.

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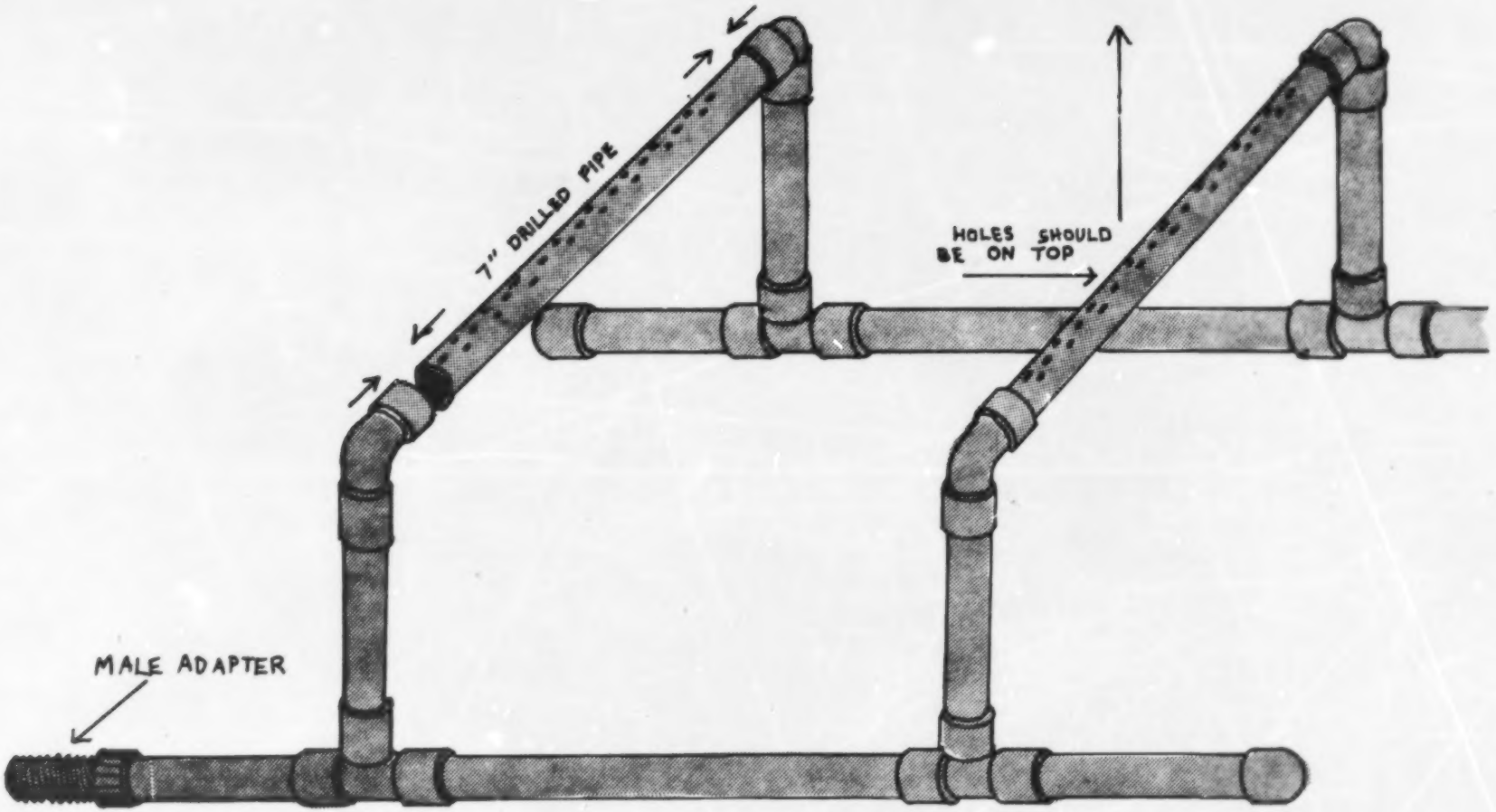
STEP 24 – Connect the ells together with the two pieces of 7 inch (17.78 cm) pipe that have been drilled (holes upward).

IMPORTANT NOTE: Locate holes in upper side of pipe so that water will be sprayed upward and to the side.

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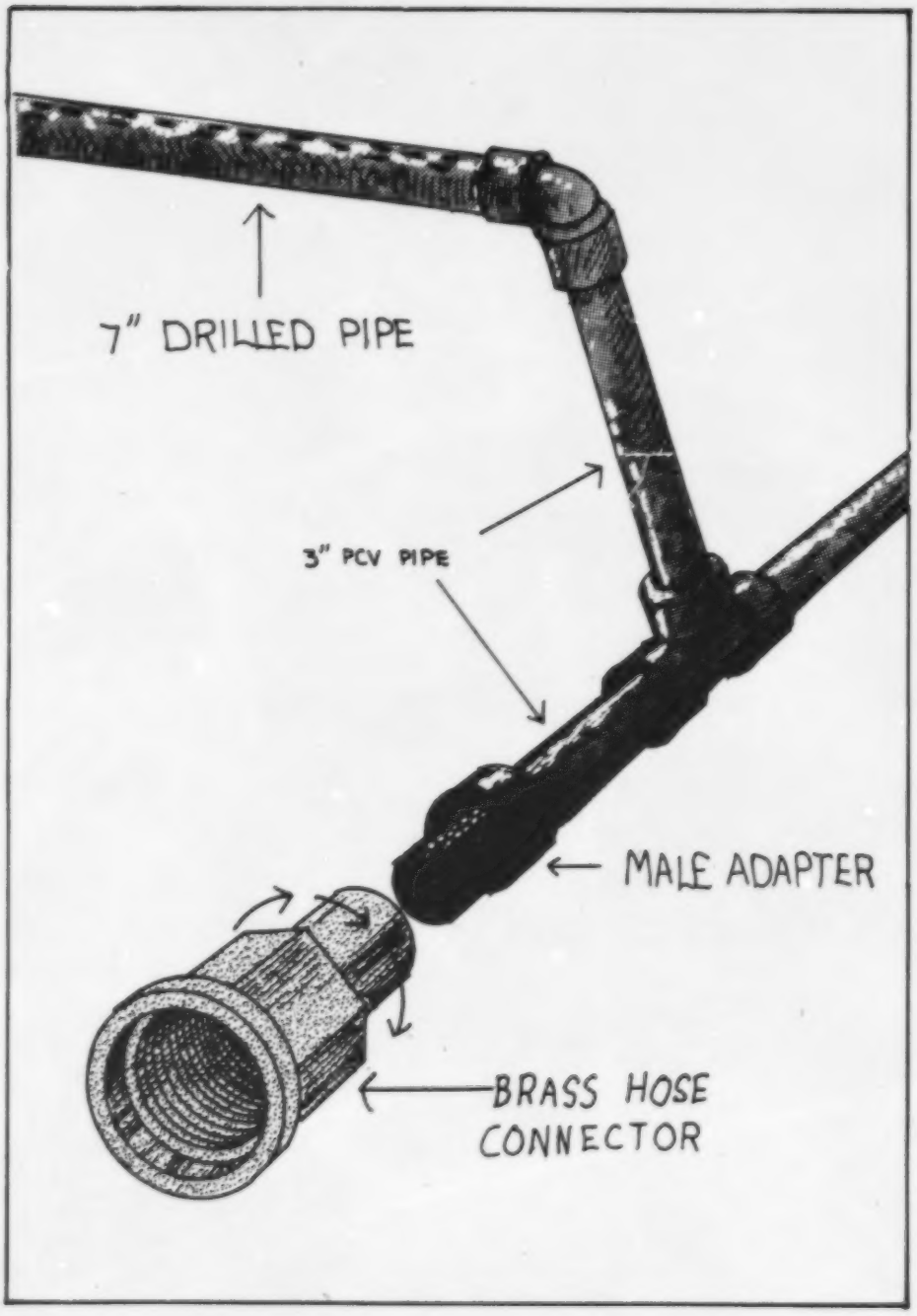
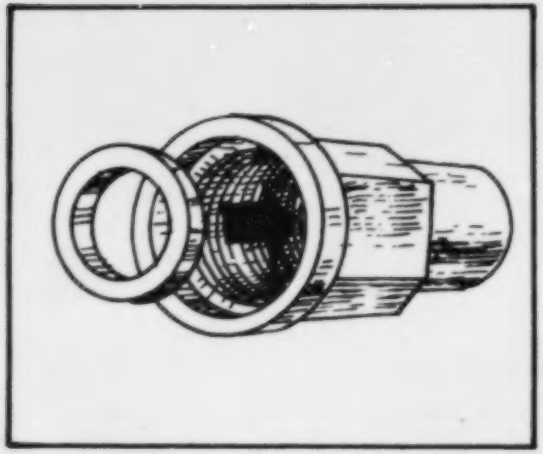
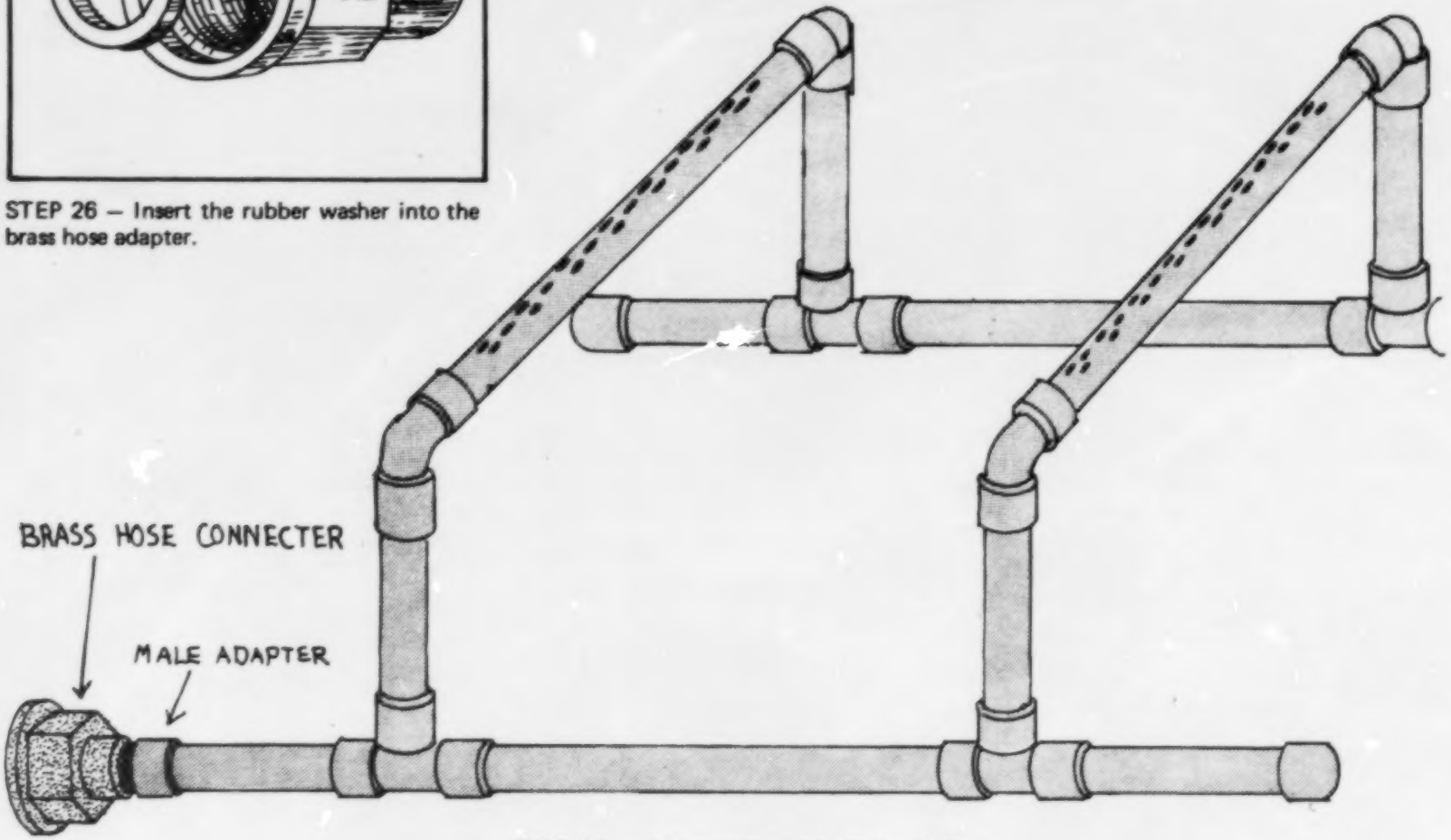
STEP 25 – Next, screw the brass hose connector into the 1/2 inch (1.27 cm) male adapter.





STEP 26 – Insert the rubber washer into the brass hose adapter.




STEP 27 – Your completed project should now look like this.

## Check Point

**Yellow Area – Assembly**

Answer the following questions in the Yellow Area Checkpoint booklet.

DO NOT WRITE IN THIS GUIDE

Check "yes" or "no"

1. Did you have any pieces left over?
   Yes _____ No _____
2. Did you align the pieces so that your project appears straight and even?
   Yes _____ No _____
3. Did you place the sprinkler holes upward so that water will spray upward and to the sides rather than downward?
   Yes _____ No _____
4. If you have completed these questions, ask your instructor to check your work.
5. If you have successfully completed your work, sign your name to this booklet and return it to your instructor.
6. If additional work is necessary, redo the steps and the checkpoint.

## OCCUPATIONAL DESCRIPTIONS

**862.381-030 PLUMBER (const.)**

Assembles, installs, and repairs pipes, fittings, and fixtures of heating, water, and drainage systems, according to specifications and plumbing codes: Studies building plans and working drawings to determine work aids required and sequence of installations. Inspects structure to ascertain obstructions to be avoided to prevent weakening of structure resulting from installation of pipe. Locates and marks position of pipe and pipe connections and passage holes for pipes in walls and floors, using ruler, spirit level, and plumb bob. Cuts openings in walls and floors to accommodate pipe and pipe fittings, using handtools and power tools. Cuts and threads pipe, using pipe cutters, cutting torch, and pipe-threading machine. Bends pipe to required angle by use of pipe-bending machine or by placing pipe over block and bending it by hand. Assembles and installs valves, pipe fittings, and pipes composed of metals, such as iron, steel, brass, and lead, and nonmetals, such as glass, vitrified clay, and plastic, using handtools and power tools. Joins pipes by use of screws, bolts, fittings, solder, plastic solvent, and calks joints. Fills pipe system with water or air and reads pressure gages to determine whether system is leaking. Installs and repairs plumbing fixtures, such as sinks, commodes, bathtubs, water heaters, hot water tanks, garbage disposal units, dishwashers, and water softeners. Repairs and maintains plumbing, by replacing washers in leaky faucets, mending burst pipes, and opening clogged drains. May weld holding fixtures to steel structural members. When specializing in maintenance and repair of heating, water, and drainage systems in industrial or commercial establishments is designated PLUMBER, MAINTENANCE (any ind.).

**862.682-010 PIPE CUTTER (mfd. bldgs.)**

Operates machine to cut, thread, and ream pipes, and assembles pipes, according to blueprints, to form mobile home water system, using handtools: Measures and marks pipes to be cut and threaded, using tape measure and pencil. Positions and secures pipe in chuck of machine. Starts machine and turns handwheel to engage pipe with dies that cut threads. Pulls lever to lubricate pipes and dies, and turns handwheel to activate reaming tool to bur inside of pipe. Moves lever to open dies, and turns handwheel to disengage dies from pipe. Repositions pipe in chuck and alines cutting wheels with mark on pipe. Starts machine and turns handle to apply pressure on cutting wheels. Applies sealing compound to threads and fittings with brush and joins pipes in sequence specified, according to blueprints, to form water system, using wrench and vise.

**862.684-026 PLUMBING ASSEMBLER-INSTALLER (mfd. bldgs.)**

Assembles and installs manufactured building bathroom hardware, fixtures, and plumbing, under direction of PLUMBER (mfd. bldgs.): Cuts copper tubing according to written instructions, using powersaw. Connects, solders, and squares pipes, using solder paste or solder and torch, vice, and level. Selects preassembled wall plumbing units, such as risers, air chamber, and valves, according to diagram. Fastens units to studs with metal braces, using hammer and nails. Selects, assembles, and installs fixtures, such as tub, sink, toilet, and shower fixtures, using handtools. Applies glue to vanity and sets vanity in place.